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Performance Testing of a 15K Pulse Tube Cooler for Space Applications

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Air Liquide has been working with ESA, CEA and Thales Cryogenics since 2010 to design, manufacture and test a 15K Pulse Tube Cooler system.

This cooler is particularly adapted to the pre-cooling needs of cryogenic chains designed to reach 0.1-0.05K for focal plane cooling on scientific space missions such as ATHENA.

The cooler is designed to provide cooling power $>0.3W$ at temperatures from 15 to 18K with an electrical power budget less than 300W (excluding electronics) and a 288K rejection temperature. Significant cooling power at an intermediate temperature (typically 80-100K) is also available.

The design includes two cold fingers mounted on a common warm flange driven by a single high power compressor (240W PV power) specially developed for this application. The first cold finger is used to pre-cool the second, low temperature stage.

An Engineering Model has been manufactured and the design and test results will be presented in this paper.

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